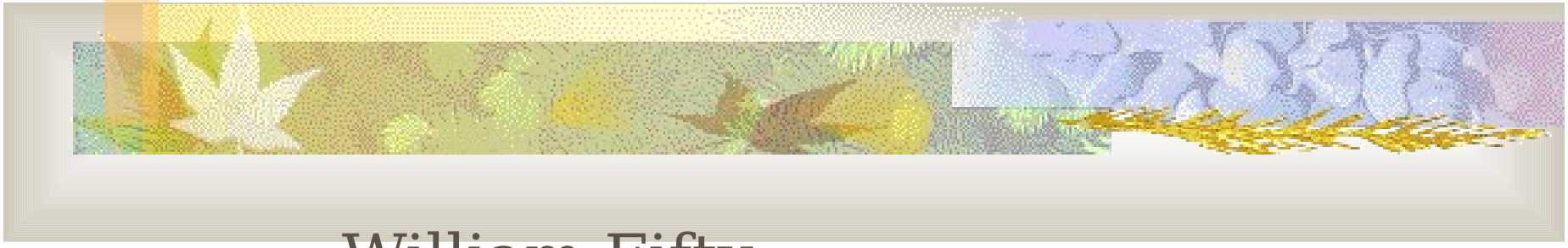
Water Conservation, Reclamation and Reuse



William Fifty

USACHPPM - Surface Water and Wastewater Program

Sustaining the Army Mission

- Water Sustainability Goals (Ft Lewis)
- By 2025
  - Cascade water use to achieve zero discharge of wastewater
  - Reduce potable water consumption by 75%
  - Contribute no pollutants to groundwater and remediate all contaminated groundwater
- By 2012, develop effective regional aquifer and watershed management program

Mechanisms

- Conservation
- Reclamation and Reuse
- Augmentation

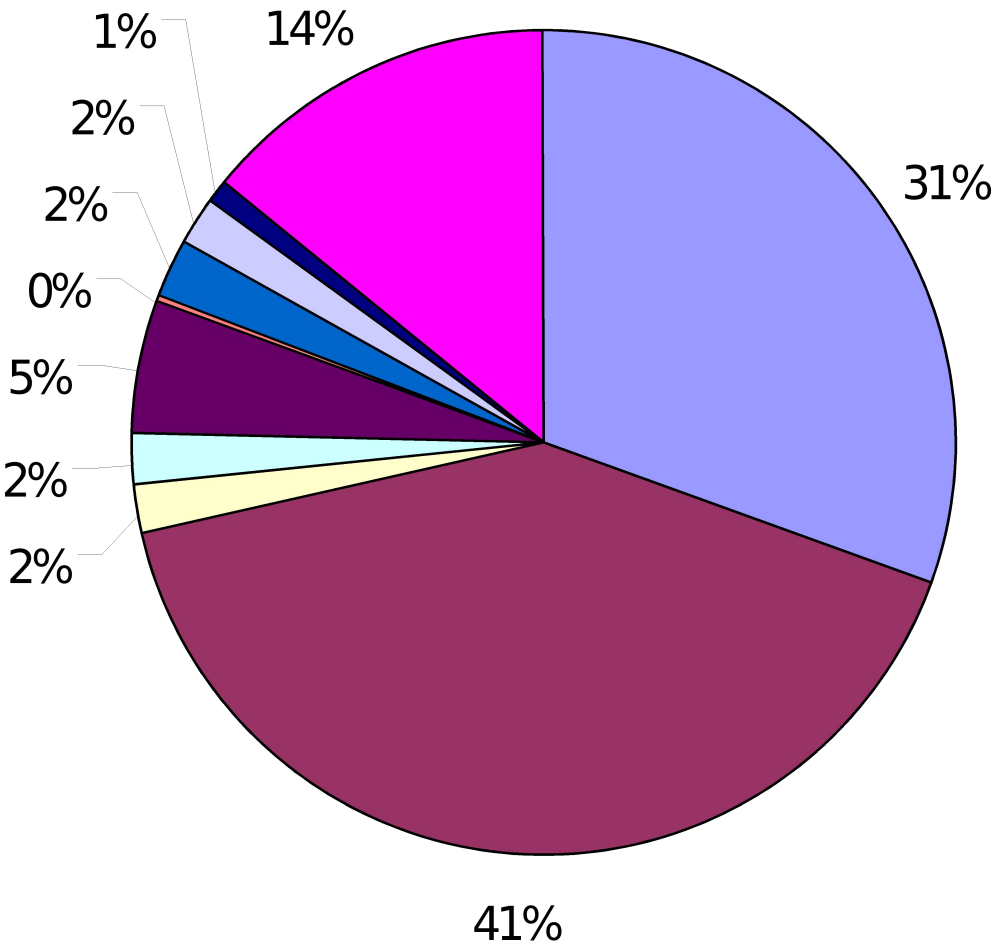
Conservation

EO 13123, Greening the Government Through Efficient Energy Management

Water Conservation Goals

- Water Management Plan
  - Utility information
  - Water conservation opportunities
  - Emergency planning for shortages
- 4 (or more) water efficiency BMPs
- Army (ACSIM) Deadline
  - Water Management Plan – Oct 04
  - Implemented BMPs - 2010

APG Potable Water Usage



Federal Energy Management Program BMPs

- Include
  - Operations and Maintenance Options
  - Retrofit and Replacement Options
    - < 10 year pay back

BMPs

- 1 - Public Information and Education Programs
  - Generate 10-15% annual savings in water usage

BMPs - continued

- 2 - Distribution System Audits, Leak Detection, and Repair
  - If losses > 20%, conduct audit or leak detection survey
  - Repair/replacement of pipes
    - Only 25% savings

BMPs - continued

- 3 - Water Efficient Landscaping
  - Promising if water usage > 10%

Potential Reductions in Landscape Water Use

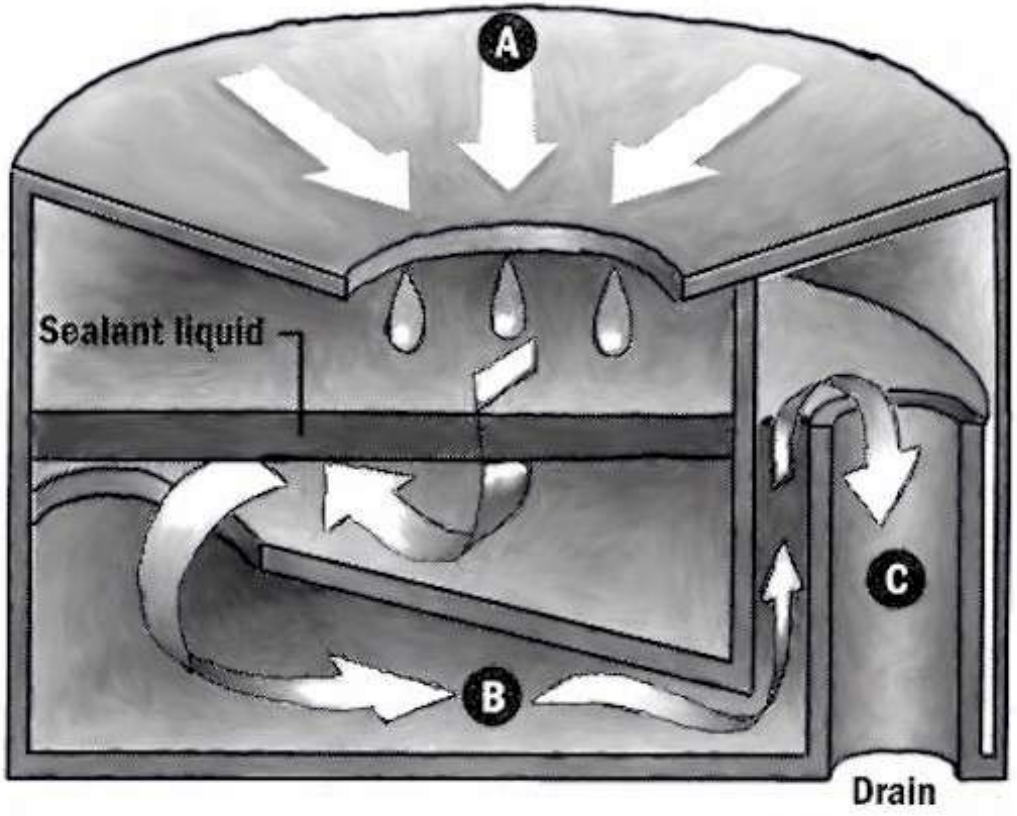
Management Options	Potential Savings (%)
Turf Maintenance	10
Turf Maintenance, Irrigation System	20
Hardware Options	
Auto Rain Shut Off	10
Soil Moisture Sensors; Soil Probes	10 to 30
Drip/Bubbler Irrigation	50
Gray Water	Up to 100
Landscape Design Options	
Landscape Design	19 to 55
Turf Reduction	19 to 35
Choice of Plants	30 to 80

BMPs - continued

- 4 - Toilets and Urinals
  - Fix leaking toilets
  - Replacement of old to
- Flushing Standards
  - < 1994, 4-7 gpf
  - currently 1.6 gpf

Dual Flush Toilets

Waterless Urinal



BMPs - continued

- 5 - Faucets and Showerheads
  - Current standard 2.5 gpm
- Other opportunities for residential water savi
  - Dishwashers
    - From 9 to 5-7 gal per lo
  - Clothes washers
    - From 41 to 23 gal per l

BMPs - continued

- 6 - Boiler and Steam Systems
- 7 - Single Pass Cooling Equipment
- 8 - Cooling Tower Management
- 9 - Miscellaneous High Water Using Processes
  - Food Service Areas
- 10 - Water Reuse and Recycling

Reclamation and Reuse

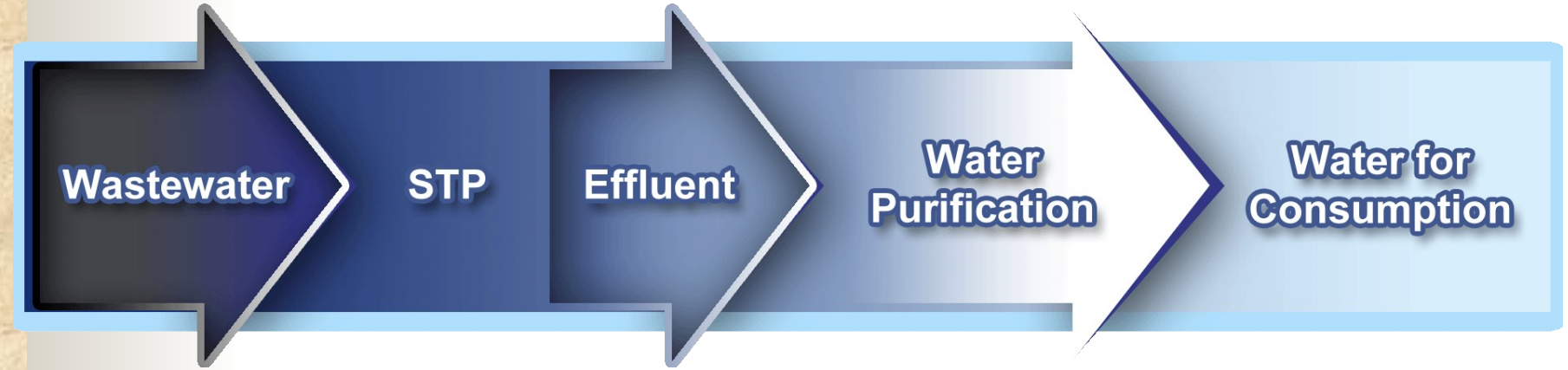
Source Substitution

Reuse Regulations

- No Federal regulations or standards for water reclamation and reuse
  - “Guidelines for Water Reuse” - 2004
- State agencies are responsible for water reuse standards

Potable Water Reuse

- Non-potable Water Reuse
  - Water is not suitable for drinking
- Direct Potable Reuse
  - Not practiced in US



Requirements for Non-potable Reuse

- Conventional water and wastewater treatment technology
- Match between water quality and intended use
- Protection of human health
- Public acceptance where it is being introduced

Reclaimed Water Match grade, treatment, designated use

grade 1	grade 2	grade 3	grade 4	grade 5
secondary, filtration, disinfection	grade 1, plus NH3 removal	secondary, ultra-filtration, RO	grade 3 plus lime softening	double RO
landscape irrigation	cooling towers	low pressure boiler feed	potable water aug-mentation	high pressure boiler feed

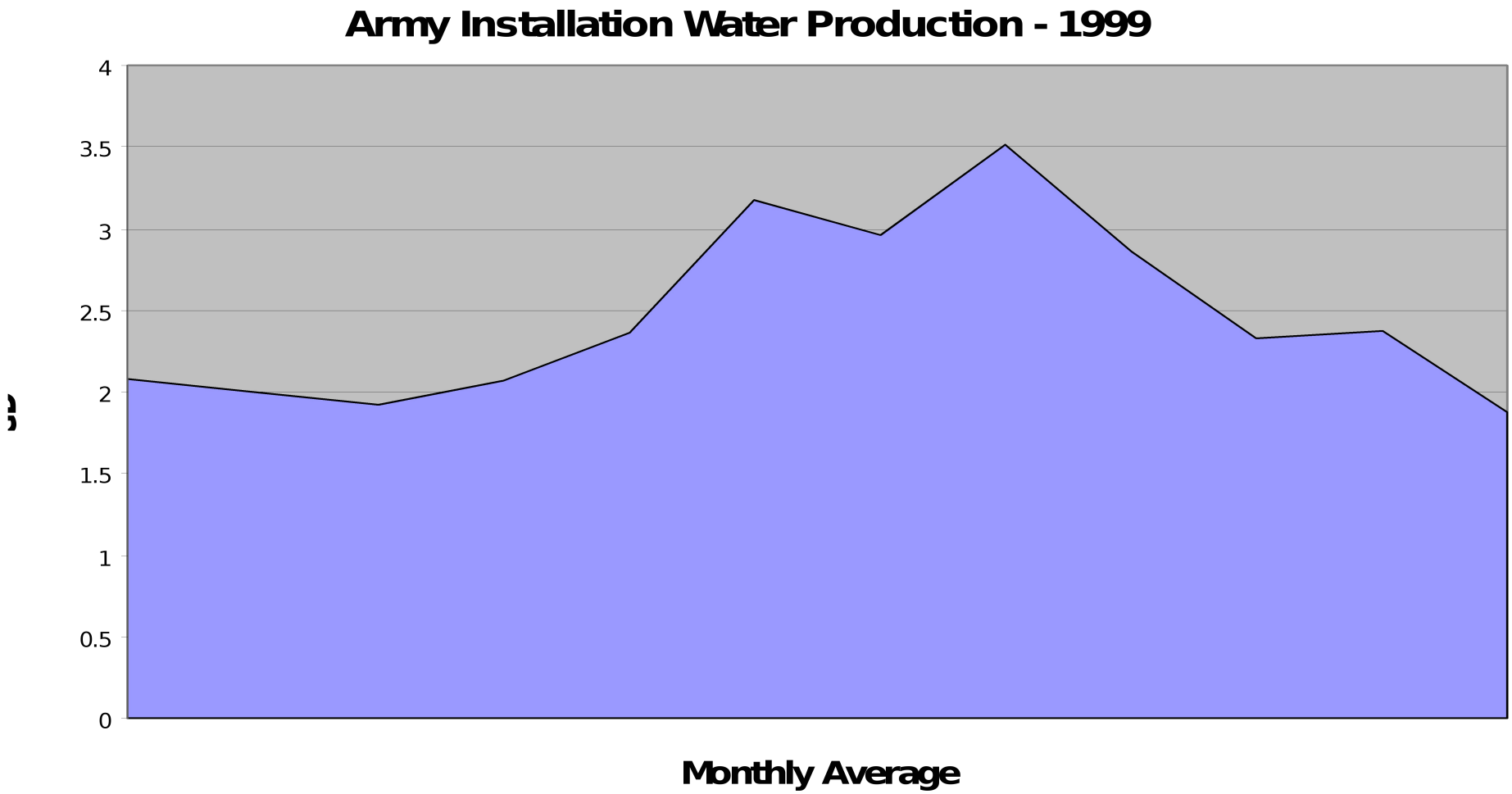
Reuse Option 1: Landscape Irrigation

- Parade fields, recreation fields, landscaped areas, and golf courses (water hazards)

Landscape Irrigation

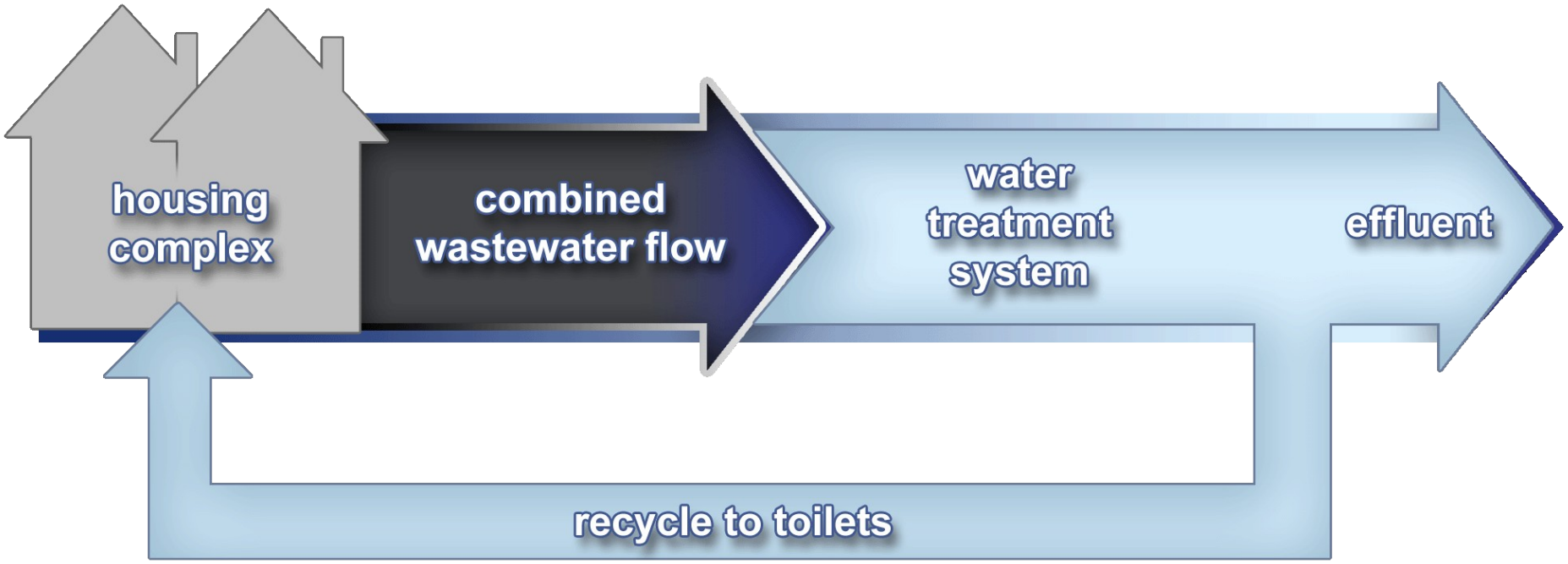
- Single Family and Multifamily Residences

Landscape Irrigation – Seasonal Demand



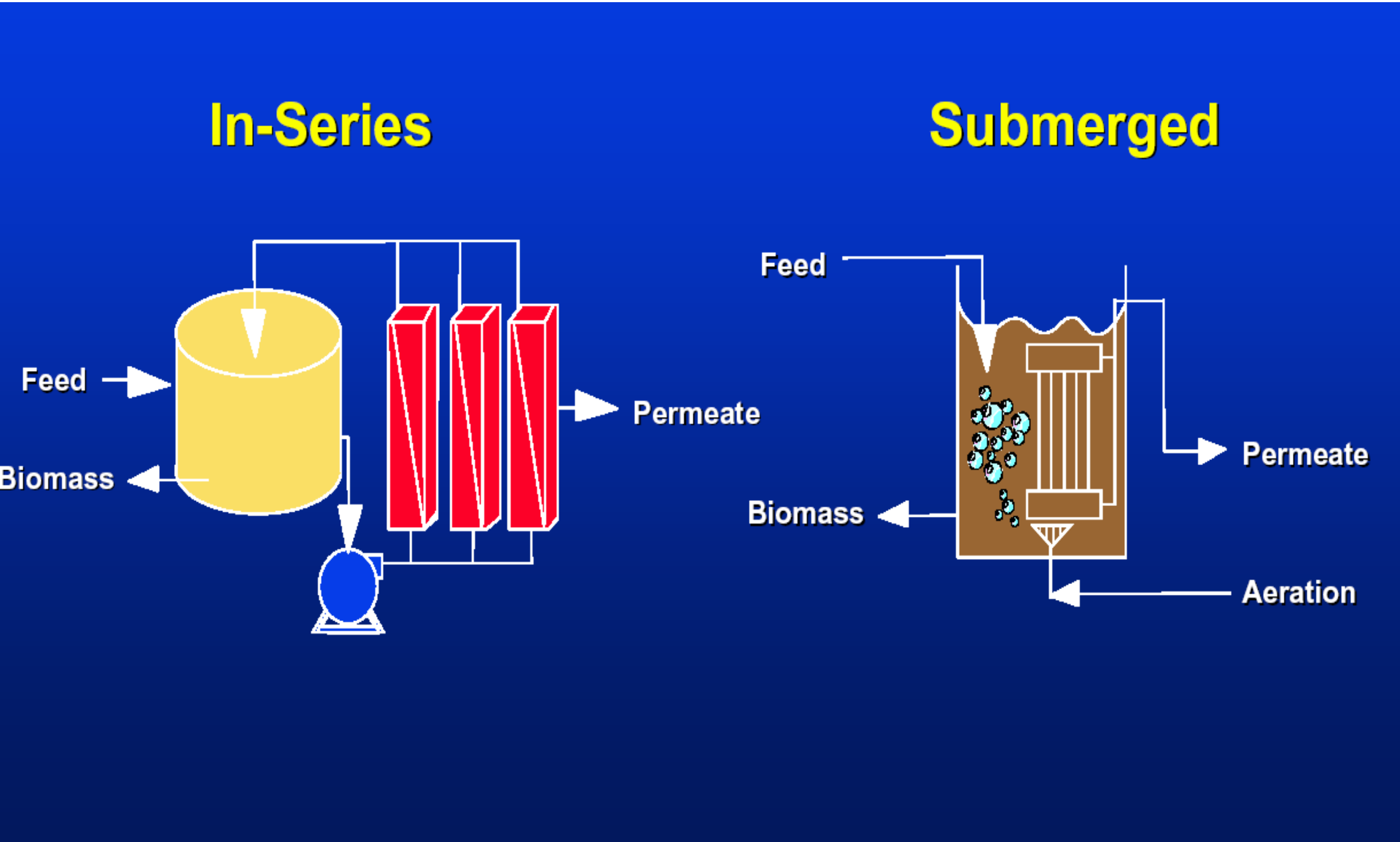
Water Reuse Feasibility Study

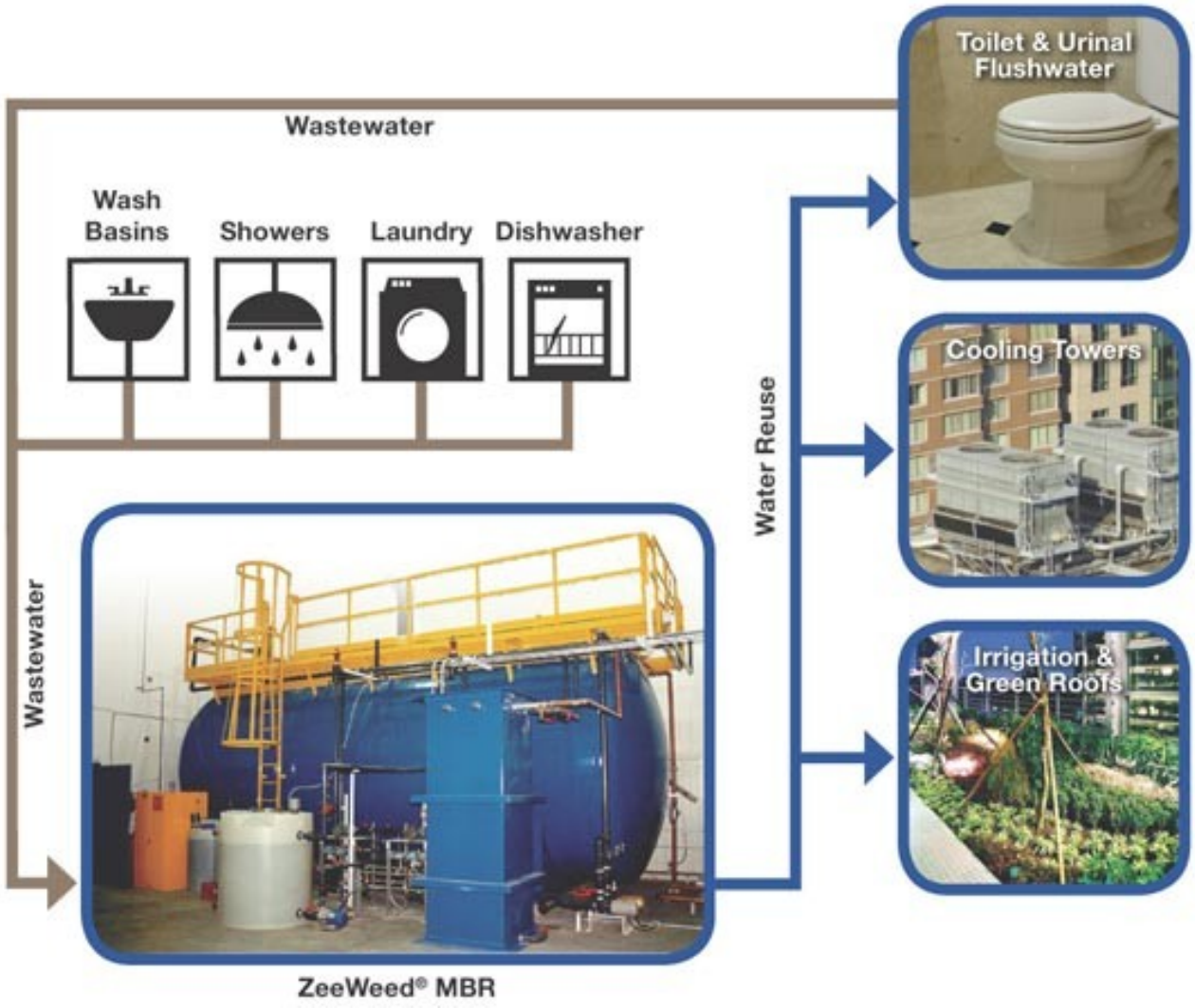
Reuse Option 2: Toilet Flushing



U.S. Army Kwajalein Atoll

Membrane Bioreactor Configurations




Wastewater
Wash Basins
Showers
Laundry
Dishwasher
Wastewater
ZeeWeed® MBR
Water Reuse
Toilet & Urinal Flushwater
Cooling Towers
Irrigation & Green Roofs

Reuse Option 3: Vehicle Washing

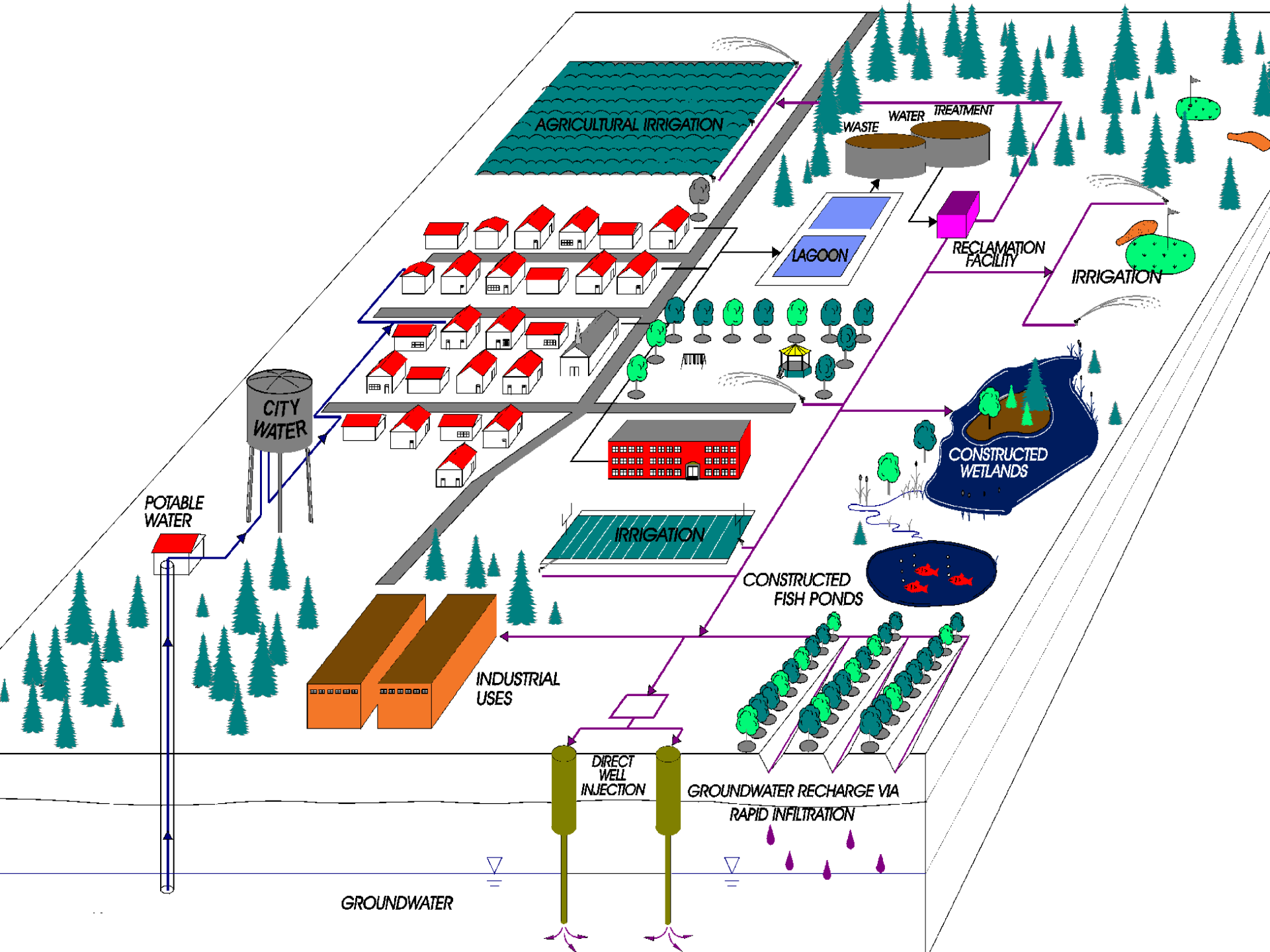

HE
HYDRO
Hydrosite - Portable Corrosion Control Equipment
HYDROBLASTER - HYDROKLEEN - HYDROPAD www.hydroblaster.com
OLD DOMINION

Reuse Option 4: Industrial Applications

- Central Energy Plant
  - Cooling tower make up
  - Wet scrubbers
  - Boiler make up water

Reuse Option 5: Dust Suppression

Reuse Option 6: Man-made Wetlands


AGRICULTURAL IRRIGATION
WASTE WATER TREATMENT
LAGOON
RECLAMATION FACILITY
IRRIGATION
CITY WATER
POTABLE WATER
CONSTRUCTED WETLANDS
IRRIGATION
CONSTRUCTED FISH PONDS
INDUSTRIAL USES
DIRECT WELL INJECTION
GROUNDWATER RECHARGE VIA RAPID INFILTRATION
GROUNDWATER

Augmentation of Potable Water Supplies

Groundwater Recharge

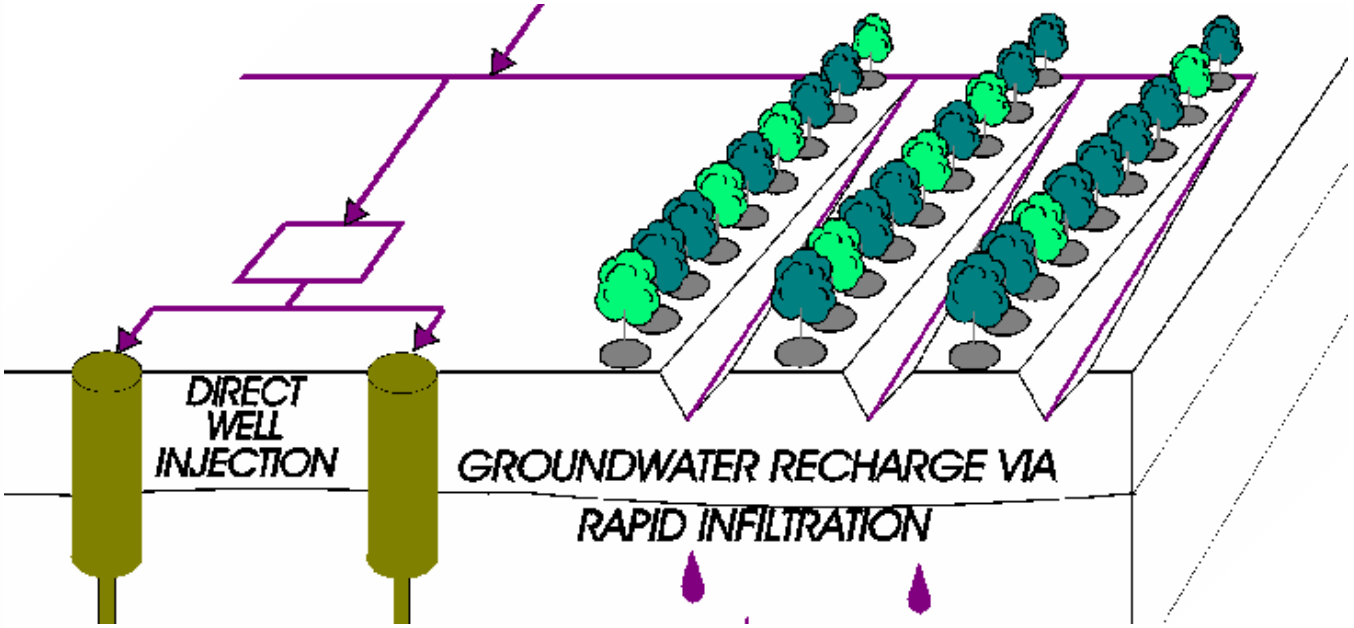
Stream Augmentation

Groundwater Recharge

- Intent is to replenish groundwater
- Applications
  - Augmentation of potable water supplies
  - Storage for reclaimed water
    - Aquifer storage and recovery (ASR)
  - Establish salt-water intrusion barriers in coastal areas

Recharge Mechanisms

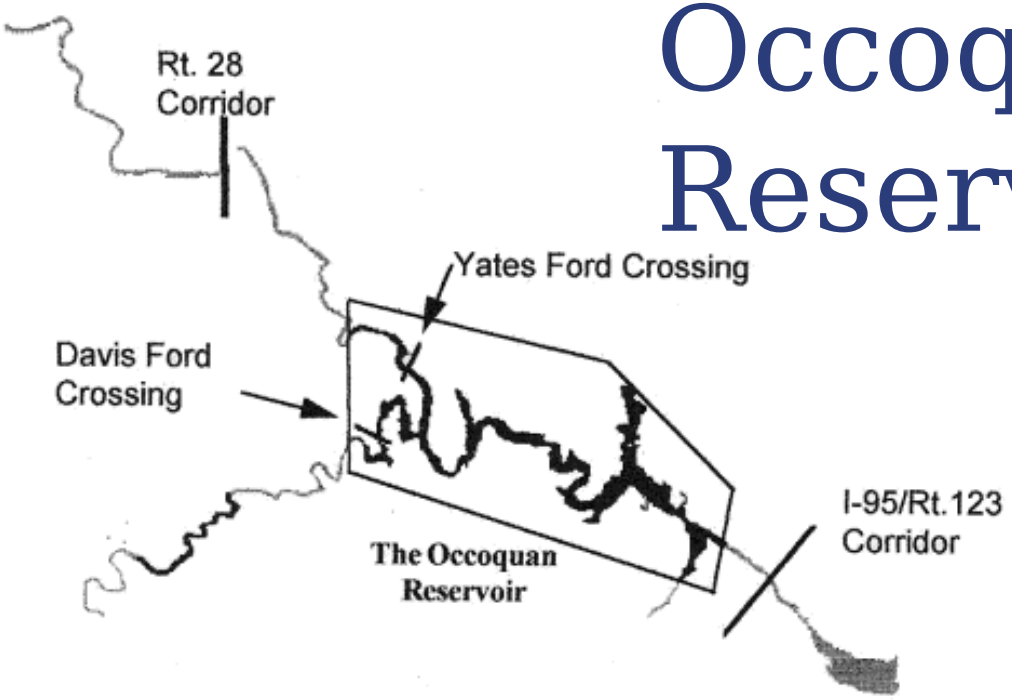
- Surface spreading
- Direct injection



Stream Augmentation

- Seeks to replenish a surface water
- Applications
  - Augments a potable water supply
  - Maintains stream flow for fish, wildlife, and aesthetics

Occoquan Reservoir



Conclusion

- As water resources become stretched,
  - Increased pressure
  - Increased opportunities
- Be prepared to act when
  - Water availability is questioned
  - Normal life cycle equipment is replaced
  - Construction of new facilities

Questions

- USACHPPM, Bill Fifty
  - (410) 436-3816
  - William.Fifty@us.army.mil